COMPOSITE SEMICONDUCTOR STRUCTURE AND DEVICE WITH OPTICAL TESTING ELEMENTS

ABSTRACT OF THE DISCLOSURE

A composite semiconductor structure includes islands of noncompound semiconductor materials formed on a noncompound substrate, and an optical testing structure. In one embodiment, a scan chain runs through the noncompound substrate (and possibly also through the islands) and terminates in the islands at optical interface elements, one of which is an optical emitter and the other of which is an optical detector. A test device inputs test signals to, and reads test signals from, the scan chain by interfacing optically with the optical interface elements. In another embodiment, an optical detector is formed in the silicon substrate and an optical emitter is formed in the compound semiconductor material. A leaky waveguide communicating with the emitter overlies the detector, and detection by the detector of light emitted by the emitter is an indication of the absence of an intended circuit element between the detector and the leaky side of the waveguide.